CLAIMS

What is claimed is:

1. A plating system comprising:

an elongated upper channel and an elongated lower channel; and

a plating solution sparger comprising a series of inlets oriented to direct any plating solution flowing through the inlets into one and towards another of the upper and lower channels.

2. The system of claim 1 further comprising:

an anode; and

a substantially planar cathode comprising a first surface conductive surface, a second conductive surface, and a perimeter edge, the first conductive surface and second conductive surfaces being substantially parallel to each other and positioned on opposite sides of the cathode; wherein

the sparger is positioned at least as close to the perimeter edge of the cathode as to either of the first or second conducting surfaces.

3. The system of claim 2 wherein the sparger directs any plating solution flowing through the inlets towards the cathode in a plane substantially coplanar with the cathode.

4. The system of claim 3 wherein:

each of the upper and lower channels comprises two substantially planar and parallel non electrically conductive sides that are substantially parallel to the cathode; and

the cathode is positioned at least partially within each of the upper and lower channels between the non electrically conductive sides.

5. The system of claim 4 wherein:

the upper and lower channels are positioned opposite each other and are separated from each other, the separation between the channels forming a pair of solution egress slots; and

the channels are adapted to prevent current from flow between the anode and cathode other than through the egress slots.

6. The system of claim 5 wherein the egress slots are positioned approximately parallel to a center line of the cathode.

7. The system of claim 6 wherein the cathode comprises a dielectric substrate and the conductive surfaces are adapted to promote the formation of heat spreaders on the dielectric substrate.

8. The system of claim 1 wherein each of the upper channel and lower channel have a width less than or equal to one inch.

9. The system of claim 1 wherein the sparger is positioned horizontally and directs any plating solution flowing through the inlets into the lower channel and towards the upper channel.

10. The system of claim 1 wherein each of the upper channel and lower channel have a width less than or equal to 0.5 inches.

11. The system of claim 1 wherein each of the upper channel and lower channel have a width less than or equal to 0.5 inches, and the further comprising a plurality of part holding clamps electrically coupled to a power source and positioned within the upper channel or the lower channel.

12. The system of claim 1 further comprising a plurality of anodes positioned outside and along the length of the upper and lower channels.

13. The system of claim 1 wherein the upper channel and lower channel are separated by a distance and at least one of the upper channel and lower channel are adapted to be moved to vary the distance.

14. The system of claim 1 wherein the shortest distance from a part being plated to a channel wall is less than the shortest distance between the channel wall and an anode.

15. A plating system comprising:

an anode, a planar cathode, a sparger, and a plurality of electrically insulating shields; wherein

each of the plurality of shields is positioned between the anode and the cathode but not between the sparger and the cathode, and each of the plurality of shields is approximately co-planar with one of two reference planes that are substantially parallel to the cathode; and

the sparger is adapted to direct plating fluid toward and edge of the cathode along in a plane substantially co-planar with cathode.

16. A method of plating a work piece comprising:

submerging a work piece to be plated in a volume of plating solution;

positioning a work piece to be plated at least partially within an upper plating channel and a lower plating channel, the upper and lower plating channels comprising non electrically conductive sides, the channels being positioned opposite each other and being separated from each other, the separation between the channels forming a pair of solution egress slots positioned approximately over the center of the work piece to be plated;

causing electrical current to flow between the work piece and one or more anodes, the current flowing into the upper and lower channels only after passing through the solution egress slots; and

moving the work piece to be plated along the length of the plating channels to form one or more internal heat spreaders on a surface of the work piece which is essentially parallel to the shields.

17. The method of 16 further comprising:

coupling the work piece to a frame adapted to hold and move the work piece during plating;

after plating, performing a first rinse and dry cycle wherein at least a portion of the frame is rinsed and dried while the work piece is kept damp;

after the first rinse and dry cycle, performing a second rinse and dry cycle wherein the work piece is rinsed and dried.

18. The method of claim 17 wherein water is used in the first and second rinse cycles, and the second rinse cycle utilizes water having fewer impurities than that used in the first rinse cycle.